

2. Review of China's carbon trading market

2.1 Transactions of carbon trading pilot

By June 2018, according to the data released by the seven pilot exchanges, the total carbon market quota transactions of the seven pilots 2016 was about 146.354 million tons, and the transaction volume reached 2.97 billion yuan, with an average transaction price of 21.9 yuan/ton. The carbon quota trading price of the national carbon market has been decreasing first and then stabilizing in the past five years. For the pilots, the total carbon emissions and intensity of these regions have shown a downward trend. Hubei's trading volume accounted for 34.3% of the total volume in national carbon trading pilots, ranking first; Tianjin trading volume accounted for 2%, ranking the last.

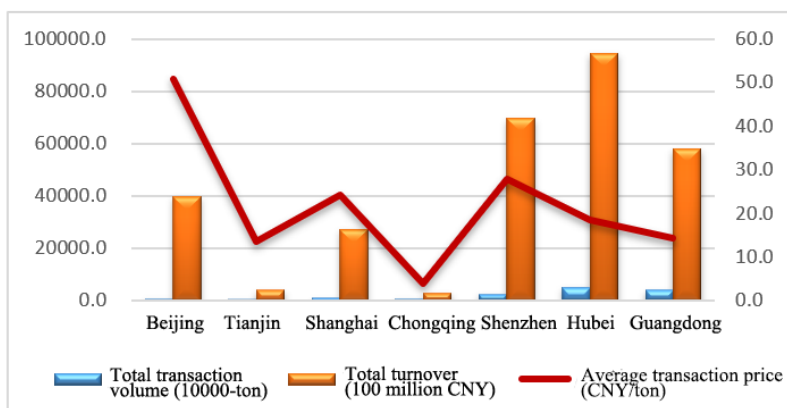


Figure 1: China's carbon trading pilot transactions in 2013-2018

2.2 Performance of carbon trading pilot

Of the seven domestic carbon trading pilot areas, five have completed three performances and two have completed two performances. Table 1 lists the status of each pilot performance below:

Table 1: Performance of China's carbon trading pilots

Performance	Beijing	Tianjin	Shanghai	Chongqing	Shenzhen	Hubei	Guangdong
Performance rate in recent three year (%)	100	99.1	100	70	99.7	81.16	100

The main purpose of carbon market regulation is to maintain market order, prevent the illegal actions such as insider trading, market manipulation, and publishing false market information etc (Liu et al., 2017). At present, the common carbon market regulation method is the MRV system (carbon emission monitoring accounting, reporting, verification system, and also the degree of market information disclosure). The MRV system has been established in all carbon trading pilots in China, forming a relatively complete regulatory mechanism.

2.3 Comparative analysis of carbon trading rules

(1) Carbon trading coverage

In the seven pilot provinces and cities approved by the National Development and Reform Commission, carbon emissions trading has basically achieved full coverage, as shown in the following table 2.

(2) Carbon quota allocation method

Of the free quota allocation methods for the carbon emission trading pilots, historical emission method is mainly dominated, and the historical strength method and the industry baseline method are flexibly adopted. The free allocation methods for quotas in each pilot are shown in Table 3.

(3) Carbon trading rules

China's carbon emission trading pilots have designated their own unique trading platforms. Trading rules and charging standards are issued by the exchange and approved by the competent authorities.

Table 2: Coverage of China emission carbon trading pilots

Contents	Beijing	Tianjin	Shanghai	Chongqing
Coverage	The total amount is about 0.05 billion tons, accounting for 40%, and covering five key emission industries.	The total amount is about 0.16 billion tons, accounting for 50-60%, and covering five key emission industries.	The total amount is about 0.15 billion tons, accounting for 40%, and covering eight key emission industries.	The total amount is about 0.13 billion tons, accounting for 40%, and covering four key emission industries.
Market threshold	5,000 tons of carbon	20,000 tons of carbon	20,000 tons of carbon for industry; 10,000 tons of carbon for non-industry	20,000 tons of carbon
Contents	Shenzhen	Hubei	Guangdong	
Coverage	The total amount is about 0.03 billion tons, accounting for 40%, and covering eight key emission industries.	The total amount is about 0.05 billion tons, accounting for 40%, and covering five key emission industries.	The total amount is about 0.388 billion tons, accounting for 50%, and covering five key emission industries.	
Market threshold	Industry 3,000 tons of carbon, 10,000 square meters for government agencies and large public buildings	60,000 tons of standard coal	20,000 tons of carbon	

Table 3: Free quota allocation methods for the carbon emission trading pilots

Pilot	Historical emission method	Historical strength method	Industry baseline method
Shenzhen	None	Some power enterprises	Most power enterprises; water enterprises; other industrial enterprises; buildings
Shanghai	Industrial sectors other than electricity; shopping malls, hotels, commercial office buildings and railway sites	None	Electricity, aviation, airports and ports, etc.
Beijing	Existing facilities in cement, petrochemical, other industries and services	Existing facilities for electricity and heat	New facilities
Guangzhou	(1) cogeneration unit; (2) mining process and other grinding processes of cement; (3) petrochemical enterprises; (4) short-process flow steel enterprises and other steel enterprises	None	(1) Pure generator set (2) Clinker production process and cement grinding process of cement (3) Long-process flow steel enterprises
Tianjin	Existing capacity in the steel, chemical, petrochemical, and oil and gas exploration industries	Existing capacity in the electric power industry	New facilities
Hubei	Industrial enterprises (except power industry)	None	Power Industry
Chongqing	Industrial enterprises	None	None

Table 4: Trading rules of China carbon emission trading pilots

Pilot	Trading subject	Trading mode
Shenzhen	Emission control units, other units and individuals	Spot trading (originally pricing), electronic bidding, block trade
Shanghai	Emission control units, other units and individuals	Public transaction and agreement transfer
Beijing	Compliance agencies and non-compliance agencies do not allow natural persons to participate for the time being. The registered capital of non-compliance agency must be 3 million yuan or more.	Public transactions and agreement transfers (over the counter)
Guangzhou	Emission control units, other units and individuals	Open bidding and agreement transfer
Tianjin	Domestic and foreign institutions, enterprises, social groups, other organizations and individuals. Foreign institutions must be Chinese-funded enterprises; natural persons must be between 18-60 years old, and must provide financial assets of not less than 300,000 yuan.	Network spot trading, agreement trading, auction trading
Hubei	Key industrial enterprises with an annual comprehensive energy consumption of 60,000 tons of standard coal and above; a legal entity with legally certified voluntary emission reductions; a carbon emission reserve institution in Hubei Province; other eligible corporate entity voluntarily participating in carbon emission trading activities	Pricing transfer and negotiated bargaining
Chongqing	Enterprise corporate entity, partnership enterprise and other organizations established according to law; the registered capital of the corporate entity shall not be less than RMB 1 million, and the net assets of the partnership enterprise and other organizations shall not be less than RMB 500,000	Open bidding and agreement transfer

3. Carbon emission targets and carbon trading strategies in key industry

3.1 Carbon emission targets in key industry

On March 17, 2016, China issued the *Thirteenth Five-Year Plan for National Economic and Social Development*, which clearly stated: “Effectively control carbon emissions in key industries such as electricity, steel, building materials, and chemicals, and promote low-carbon development in key areas of industry, energy, construction and transportation etc.” This makes specific requirements for the departmental and industry carbon emissions management during the 13th Five-Year Plan period (Ma and Chen, 2016; Tu and Ma, 2018).

According to statistics, in 2015, the CO₂ emissions in the four key industries of electricity, steel, building materials and chemicals were about 3.55 billion tons, 2.09 billion tons, 9.0 billion tons (process emissions of 830 million tons) and 1.47 billion tons, respectively, accounting for 38.2%, 22.5%, 9.7%, and 15.8% of energy consumption emissions respectively (Chai et al., 2017). The sum of carbon emissions in the four key industries (direct emissions from steel, building materials, chemical industry + power emissions) also showed a short-lived peak in 2014. Based on the simulation of carbon emissions during the 13th Five-Year Plan period, the total emissions amount will tend to stabilize or even decline. It’s predicted that during the 13th Five-Year Plan period, the power generation and carbon emissions growth in the power industry has recovered, but the overall level is the same as the high point of the “Twelfth Five-Year Plan”; with the requirements for lowering the demands and reducing over-capacity, energy consumption and carbon emissions in the steel industry are slowly declining; those in the building materials industry will also decline slowly; those in the chemical industry are expected to peak and decline slowly.

It is estimated that by 2020, the national carbon emissions and responsibility implementation mechanisms for departments and industries will be basically established. The total CO₂ emissions of energy activities in the three key sectors of industry, construction and transportation will be controlled at 6.4 billion tons, 2.1 billion t, and 900 million tons, respectively; the total CO₂ emissions in four key industries of power, steel, building

materials, and chemical industry, are at about 3.58 billion tons, 1.91 billion tons, 840 million tons, 1.48 billion tons respectively.

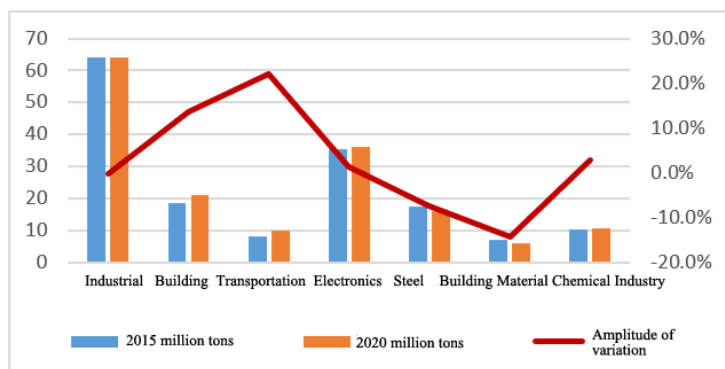


Figure 2: Carbon emissions targets of key sectors and industries

3.2 Impact of carbon emission policies on key industries

Key industries participating in the carbon trading market are faced with many challenges, including two points: First, the data statistics basis is not enough to support the needs of the carbon market, and the statistical accounting system of carbon emission data is still not perfect, making it difficult to grasp its own carbon emissions in time and accurately predict the shortage of quotas. Second, the understanding of the carbon market is not deep enough, and there is also the lack of professionals who are both familiar with the characteristics of the industry and the rules of the carbon market policy, so it is hard for enterprises to make reasonable decisions in the market.

3.3 Strategies for key industries to participate in the carbon market

(1) Change consciousness and actively participate

Firstly, enterprises should pay close attention to the development of relevant policies in the carbon market and keep abreast of the dynamics in carbon market construction. Second, enterprises should carry out capacity building work as early as possible, and reserve talents and knowledge for participating in the carbon market. Third, they should conduct examine their internal carbon emissions inventory thoroughly, and figure out their own emissions to clarify the space for emission reduction. Fourth, enterprises should well respond to the carbon market from the organizational structure and clarify the internal work processes. Fifth, they should build a systematic carbon market involvement strategy.

(2) Promote relevant legislation and formulate industry norms

In the key industries, there is still a lack of laws and regulations about emission reduction. It should be considered to include the content of regulating carbon emissions in the relevant provisions of the climate change legislation and carbon trading regulations. Meanwhile, the idea of actively controlling carbon emissions and effectively managing total carbon emissions should be reflected in the revision process of the existing laws and regulations related to the industry, construction, transportation, electricity, steel, building materials, and chemicals.

(3) Learn from foreign experience and promote market construction

At present, there are 18 carbon trading systems in operation around the world, of which the EC carbon market is the largest and the most mature. However, the carbon market in developed countries has also exposed a series of problems such as excessive quotas etc., which shall also provide valuable lessons for the construction of China's carbon market.

4. Conclusions

China's carbon trading market is still relatively lagging behind. It has the problems such as shortage of professional talents, backward development of carbon finance, and lack of carbon reserves. China should encourage all regions to accelerate the construction of a regional carbon trading market, and on the basis of development and improvement, it should take measures to build a nationwide carbon trading market. In addition, the carbon emissions control of key sectors and industry is the core of carbon reduction. For key industries, it's necessary to change our business philosophy, seize the advantages of first-in, and incorporate

the carbon trading and carbon assets management into the scope of business operations for actively promoting the construction of carbon market, and enhancing the competitiveness of industries and enterprises in carbon trading.

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